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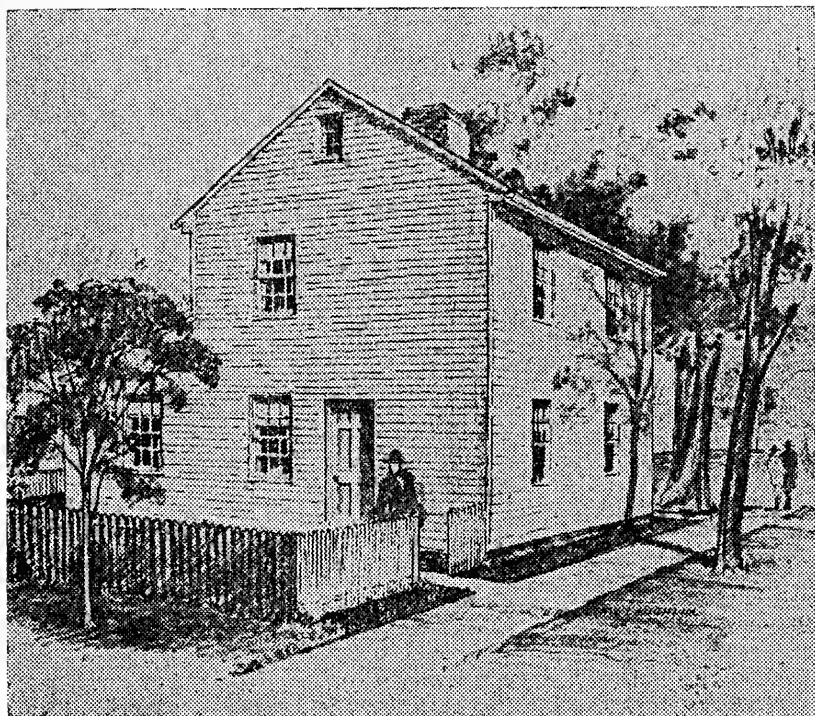


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HARMONIST CONSTRUCTION



By DON BLAIR

INDIANA HISTORICAL SOCIETY

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THE COVER: Sketch by H. ROLL McLAUGHLIN of restored "Harmonist House" owned by THE NATIONAL SOCIETY OF THE COLONIAL DAMES OF AMERICA IN THE STATE OF INDIANA.

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NUMBER 2

HARMONIST CONSTRUCTION

Principally as Found in the Two-Story
Houses Built in Harmonie, Indiana
1814-1824

by DON BLAIR



INDIANA HISTORICAL SOCIETY
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This Publication is issued by the Indiana Historical Society as a contribution to the observance of the sesquicentennial of the founding of Harmonie (now New Harmony), Indiana, by the followers of George Rapp. The author, Don Blair, is a resident of New Harmony, and has studied and examined firsthand the construction methods and materials used by the Harmonists. The photographs reproduced herein are from his collection. The renderings of the frame and brick houses and the entrance hall of "Harmonist House" are by H. Roll McLaughlin. The drawings illustrating the methods and techniques and particular features of Harmonist construction, based on sketches by Mr. Blair, were supervised by Mr. McLaughlin, A. I. A., and produced by Norman H. Jeffries, A. I. A., assisted by George W. Phares, all of James Associates, architects, of Indianapolis.

The interest shown by Mr. Eli Lilly, of Indianapolis, in the preparation and publication of this volume is gratefully acknowledged.

THE HARMONISTS

OUT OF THE DEVASTATION and misery of the Thirty Years War, the Napoleonic Wars, and the wars of the mid-eighteenth century, and out of the increasing worldliness and political action of the established Lutheran church, there developed in southwestern Germany a desire on the part of the simple, devout Christians to escape from their everyday lives into a spiritual world, one that was safe from interference of either church or state. Through the seventeenth and eighteenth centuries this movement gained strength, centering in the Kingdom of Württemberg and spreading throughout southwestern Germany. In time some of these pietistic groups began to urge separation from the established church. One such was that comprising the followers of George Rapp (1757-1847), a native of Iptingen, in Württemberg, and son of a farmer and grape grower.

As a young man Rapp was a devout student of the Bible and read widely in the writings of such pietists as Arndt, Herder, and Swedenborg. He came to believe strongly in the power of the individual to communicate directly with God and of his right to interpret the teachings of Jesus for himself. Rapp's great energy, strong intellect, and high moral force marked him for a leader, and soon he was preaching to a small group of followers. Harrassed by the established church which naturally opposed any flouting of its authority, his flock sought refuge in a land where they could live free from interference and according to the principles of "primitive" Christianity.

In 1803 George Rapp, with his son John and one of his

followers, sailed for America. He contracted to purchase some three thousand acres of land in Butler County, Pennsylvania, twenty-five miles north of Pittsburgh and about twelve miles from the Ohio. Here he was joined by some seven hundred of his flock and here was built the first Rappite community, called Harmonie. On February 15, 1805, the Harmonie Society was formed, and articles of agreement were signed between "George Rapp and Associates" and subscribers which established a communal organization based on a common fund contributed by the signers. Under the agreement the subscribers gave all their possessions to the association for the benefit of the Society and promised to obey all the rules and regulations of the community and devote their labor to its good. In return the association was to provide the privileges of church and school to its members and supply them with the necessities of life. The subscribers were to make no demands for compensation for their labor if they chose to withdraw from the association, but anyone withdrawing was to receive an amount equal to his original contribution. While the articles of agreement contained no religious tenets, it was the dominant faith and religious enthusiasm of the members along with their belief in the community's high destiny which made the Harmonie Society endure and prosper under the leadership of the extraordinary George Rapp and his adopted son Frederick.

The Harmonie Society was not evangelistic and its members were not inclined to proselyte. As John Duss, in his volume *The Harmonists* says, the Harmonists "believed it was their destiny to set an illustrious example of the harmony of human relations, the natural coöperative economy of the community of goods, and the peaceful reign of Christian fellowship under such conditions; so that other communities observing this marvel of communal life, would gradually be led to adopt a similar policy."

In 1807 the custom of celibacy was introduced, a custom voluntarily accepted and not a rule. The practice of celibacy grew out of the Harmonists' belief in the imminent

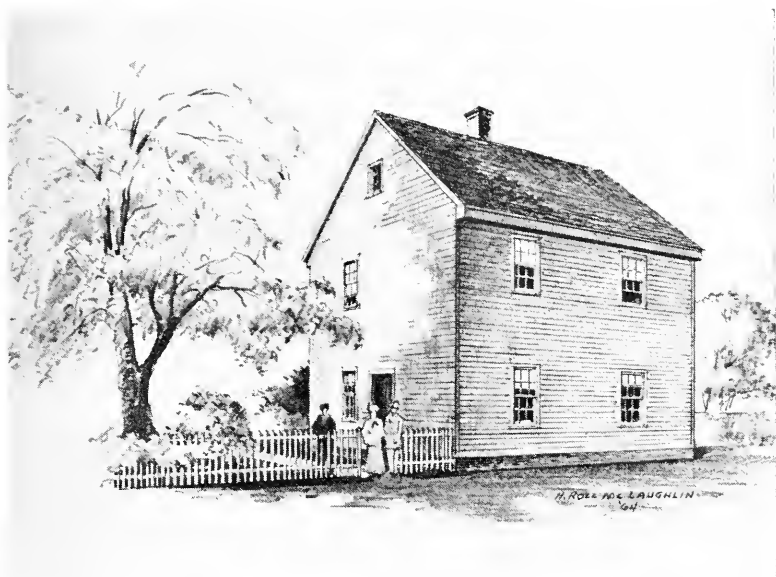


PLATE I. Typical frame house

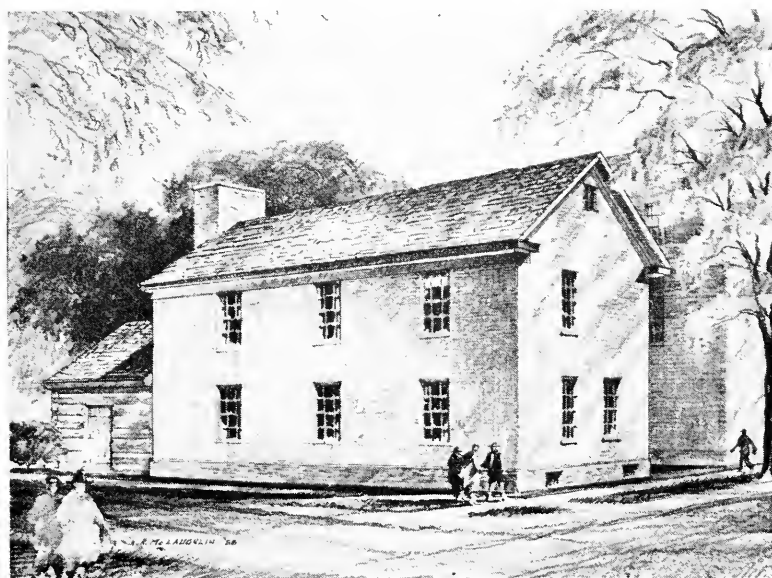


PLATE II. Typical brick house

HARMONIE, IND.

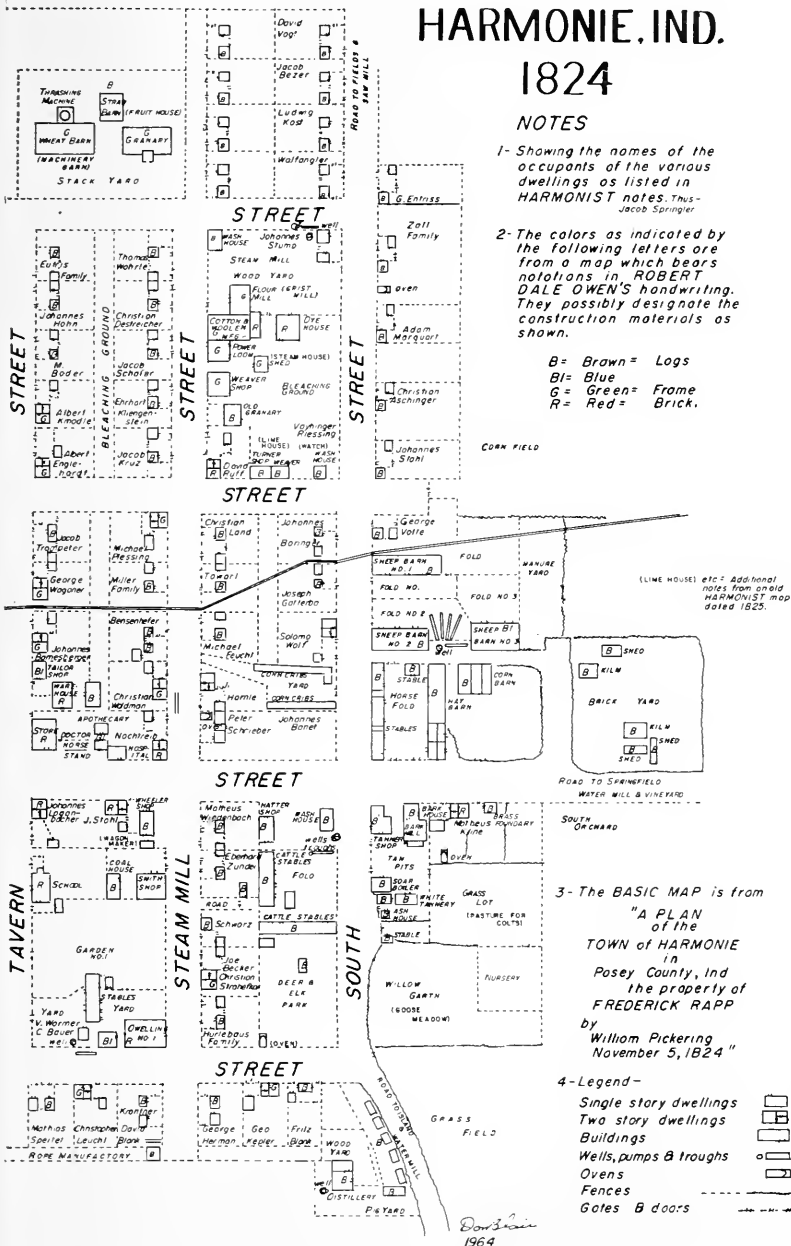
1824

NOTES

1- Showing the names of the occupants of the various dwellings as listed in HARMONIST notes. Thus-
Jacob Springer

2- The colors as indicated by the following letters are from a map which bears notations in ROBERT DALE OWEN'S handwriting. They possibly designate the construction materials as shown.

B = Brown = Logs
Bl = Blue
G = Green = Frame
R = Red = Brick.



3- The BASIC MAP is from
"A PLAN
of the
TOWN of HARMONIE
in
Posey County, Ind
the property of
FREDERICK RAPP
by
William Pickering
November 5, 1824"

4-Legend-

Single story dwellings
Two story dwellings
Buildings
Wells, pumps & troughs
Ovens
Fences
Gates & doors

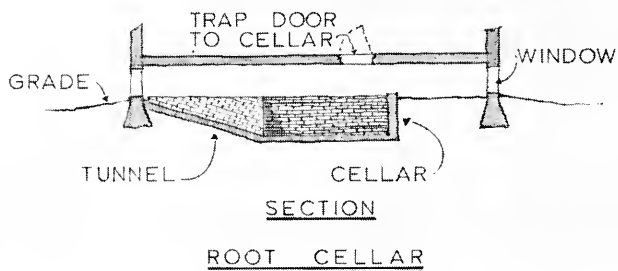
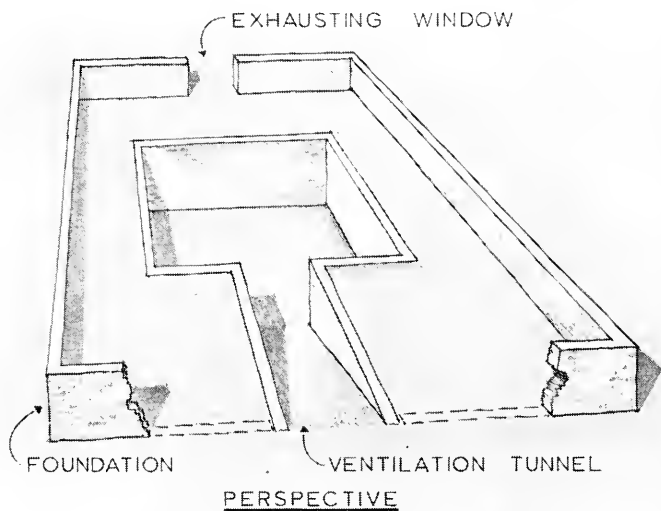


PLATE IV

return of Christ and the beginning of the Millenium. To them the Millenium was at hand; this was the beginning of the thousand years during which the saints were to reign with Christ, in accordance with Revelation 20:4, 5. William Owen, son of Robert Owen, who came to Harmonie, Indiana, in 1824, heard Frederick Rapp, the adopted son of George Rapp, preach and wrote in his diary: "He spoke from Isaiah regarding the Millenium, which he considered to have commenced 30 odd years ago; that they were the commencement and that it consisted in men living together as brothers, each for all, all for each."

While celibacy was favored, families continued to live together in their houses, but henceforth by mutual agreement, as Brothers and Sisters in Christ. Matrimony was not condemned as unlawful in those "who had not within themselves a vocation to what . . . [was] regarded as the holier state." Believing that the narrow way of celibacy was not for every one, Father Rapp did perform marriages of members of the Society and children were born to parents who were in full membership. He, however, urged his people toward this state of purification and preparation. The reward would be on the "Return of the Lord," and all was in preparation for this Return. The Harmonists should not be regarded as dull utilitarians or religious fanatics. They enjoyed comfortable living arrangements and good food, grew beautiful flower gardens, and were passionately fond of music.

HARMONIE, PENNSYLVANIA

The town of Harmonie, Pennsylvania, grew and its people prospered. The community included one hundred and fifty dwellings, most of them of brick, six larger brick houses, an inn, a store, a weaving shop, a dye plant, a woolen factory, a spacious meetinghouse, a four-story granary, a variety of mills, a brewery, and shops for various trades. There were also barns and stables, and a large warehouse built away from the town on the banks of the Ohio. In ten years the enter-

prising Harmonists had outgrown their community. They needed more space and desired an easier access to water transportation, and they also wanted a milder climate and soil suitable for vineyards.

In 1814 a party of Harmonists led by George Rapp set out to seek a new location. The site which they chose was in Indiana Territory, on the Wabash River below Vincennes. It was about fifty miles above the river's mouth, but only fifteen miles overland from the town of Mount Vernon which was on the Ohio. "George Rapp and Associates" purchased 24,734 acres of land for \$61,050. Within the next few years they purchased additional land to bring their total holdings to 30,000 acres.

The Harmonists sold their Pennsylvania property for \$100,000. In June, 1814, Father Rapp and about one hundred men moved to their new location to prepare for the arrival of the rest of the members of the association. The exodus from Pennsylvania was accomplished in detached parties—some in the fall of 1814 and the others in the spring of 1815. In the fall of 1817 one hundred and thirty new members arrived from Württemberg, offsetting the losses by death and withdrawals, and bringing the total membership again to about seven hundred.

HARMONIE, INDIANA

Harmonie on the Wabash was beautifully situated in a fertile valley. Here the Harmonists expanded all their operations—cultivating more land, raising more stock, erecting larger mills, and planting extensive vineyards and orchards, and the new town was laid out on a larger scale than the first had been. Within ten years the Harmonists had built:

82 one-story houses	several cider presses
34 two-story houses	numerous farm buildings
4 large family rooming houses	2 distilleries
2 churches, the first frame, and the second brick	2 breweries
2 schools	1 cotton gin
1 granary or "fort"	1 weaving and fulling shop
	1 dye works
	1 tailor shop

1 store	1 packing house
1 hotel	1 tannery and curriery
1 library	1 light leather manufactory
1 doctor's office	1 shoemaker's shop
1 apothecary shop	1 soap factory
1 hospital	1 saddler's shop
several wash houses	1 blacksmith's shop
several dry houses	1 watchmaker's shop
several food-processing plants	1 wagon maker's shop
2 ice houses	1 carpentry shop
2 greenhouses	1 cooper's shop
several smaller granaries	1 lime kiln
1 steam gristmill	1 brick kiln
several smaller gristmills	several pottery ovens
1 building for flour storage	1 rope walk
several wine presses	rollers for extracting oil from flax and other seeds

The solid, consistent, and systematic methods used by the Harmonists in the construction of their buildings furnish an insight into their character. These persons had in common their faith in the principles of primitive Christianity and a willingness to exercise their ingenuity, their industry, and their ability to produce in the furtherance of their cause.

Serene and confident, they lived modest and uncomplicated lives surrounded with ease and good taste. Their ability to create comfort and graciousness in the middle of the wilderness, with only the most basic tools and materials, was the constant wonder of their visitors and their neighbors. The great church which dominated the town, the well-designed and comfortable houses, a pleasant inn, and the well-stocked store amazed the traveler who had found his refuge in drafty cabins as he made his way about the frontier. Here he could rest comfortably, eat well, and make purchases ranging from good whiskey to fine linen and silk handkerchiefs. The Harmonie store did not stock its shelves with "homespun and salt pork" merchandise.

Of the thirty-four two-story houses, both brick and frame, twenty-four are still lived in, their fire-resistant quality and

their excellency of design and construction having enabled them to withstand effects of time and weather and made them desirable homes to this day. The two-story houses which have disappeared have been destroyed in the name of "progress"; none have gone through deterioration or fire. While many have been shamefully altered, they have retained enough of their individuality to be easily recognized.

We do not know how many of the small one-story houses are still standing, since many of them have been altered beyond recognition. It is certain that they form the nucleus of many of the present New Harmony dwellings.

Two of the four large community houses are still standing. One of them, Number Two, is the property of the State of Indiana; the other has been converted into a garage and filling station. During the Owenite period the latter building served as an opera house.

The hospital is used today as a private dwelling. Its larger windows and doors opening onto the street instead of the garden attest to its having been a public house instead of a residence. Unfortunately the doctor's office which stood next to it was taken down to make way for the present fire station.

The large granary built of stone and brick is still standing and is used for general storage. It is also known as the "fort," its ventilation ports resembling rifle portholes, and it could well have served as a place of refuge for the community in the face of an attack. A most outstanding building, it was used to store the community's valuables, as well as grain. A tunnel connected it with Father Rapp's house—a practical communication device and not a secret means of playing on the superstitions of his followers, as alleged by some of the detractors of the Harmonists. (It would have been impossible for the tunnel to have been a secret, since it would have to have been constructed as an open ditch and then covered over, subsoil tunneling in the vicinity being an impossibility.)

The wagon shop has been converted into a private dwelling, but the second-story door for receiving materials is still evident.

The secondary dye plant is still standing. It was built originally as an annex to Community House Number Two, and its conversion into a dye plant would have been shortly before the Harmonists' return to Pennsylvania in 1825.

The first church, a frame structure, gave way to the great brick edifice built in the form of a Coptic cross, large enough to accommodate the whole community membership of about eight hundred. This latter building was a continuing source of amazement to the traveler who had come hundreds of miles since seeing a comparable structure. Its tall steeple towered above the town and was of such proportion that the balcony which surrounded its base served as a bandstand for musicians who provided the afternoon concerts in the summertime. The church was taken down in 1874. The brick was used to build the wall around the Harmonist Cemetery, and the main church door with the rose carved over it in stone is the present west door of the New Harmony schoolhouse.

All of the other structures of the Rappite period have gone. Perhaps it should be mentioned that a labyrinth has been laid out and planted near the site of the original one. The plan for the planting was taken from a drawing that the Harmonists themselves had made. The summer house today is of stone instead of the wooden blocks used in the original, and it is similar to the summer house built in the third Harmonist community, Economy, in Pennsylvania.

THE TWO-STORY HOUSES

The construction techniques and ingenuity of the Harmonists, as well as their good taste, are particularly well illustrated in their two-story houses. In these beautifully constructed, pleasantly designed dwellings can be found the various devices developed and used by them to produce homes that would be both comfortable and lasting.

The Problem of Subsurface Water

Among the first construction problems that the Harmonists had to solve were those posed by the surface and subsurface

water. The surface water was the result of the undrained river bottoms which surrounded the site of their town. The town itself was above the flood line of the Wabash, but there was a pronounced tendency toward swampishness as there was no natural drainage. The subsurface water was the result of the Wisconsin glacial invasion and the accompanying deluge. The water from the melting ice fields gouged the loose earth from this area down to solid rock, and filled the great excavation with porous glacial debris. The water which filled the voids in this coarse material created an almost inexhaustible underground lake.

The problem of the surface water was easily solved by digging tributary ditches to a principal canal that was dug through the center of the town, running north from the south edge of the Wabash River. This main canal was deep and wide enough to require bridges whenever it intersected streets. The low elevation of the bottom of the canal served to lower the water table, in general, thus freeing the surface from possible saturation.

While the subsurface lake was a great boon to industry and agriculture, as it made fresh water available just beneath the surface, it offered many problems in constructing and maintaining buildings. The moisture, if captured beneath a structure, encouraged the rotting of the timbers. Damp earth under the foundations would allow them to settle and mean ultimate damage. Brick walls would be kept damp by capillary action. The damp earth, besides threatening the structures, also was the ideal breeding place for malaria-bearing mosquitoes.

The Harmonists solved the problem of keeping the area under the frame house dry in a simple manner: instead of a solid foundation, open piers were used to support the house. This open construction allowed a free circulation of air, keeping the ground dry and the timbers free of rot. The framing of the house was so designed that there was no problem in spanning the distance between the piers. Actually the greater part of the load was carried on only nine points. Aside from

the four corners, there were two piers, one at each end of the center beam; piers at the points where the interior cross wall met the exterior walls; and a pier at the point where the interior walls joined (under the center beam, thus carrying much of the weight of the second floor). The success of this simple solution is attested by the houses so built still standing in sound condition after one hundred and fifty years.

The brick houses were another matter. Their need for a continuous foundation to support their masonry walls and their vulnerability to differential settlement offered a much greater challenge to the Harmonists' ingenuity. Their solution here is a definite indication of their knowledge and skill. Each of these houses had its "root cellar" for the preservation of semi-perishable foods. By digging a tunnel on a slope from the outside of the house to the bottom of the cellar and cutting an exhaust window in the opposite wall, they were able to set a circulation of air in motion—the heavier cool air displacing the lighter warmer air—keeping the cellar cool and the area under the house dry. (See Plate IV.)

The Problem of Differential Settlement

The Harmonists were aware that differential settlement would result from uneven loadings to the foundations, so that at each load point there had to be an individual footing designed for its particular loading. It would be a great temptation to any builder to support the center of a house on the chimney which was located approximately in the center, but the Harmonists, with their knowledge of stress analysis, avoided this pitfall. In their houses the center load is actually carried on the intersection of the interior walls, each of which was in turn carried on an individual footing which was free from the load of the chimney.

Chimney and Fireplace

In the houses heated by fireplaces, special protection was used against the danger of the open flame. In front of the fireplace a box was built in the floor with a depth equal to the

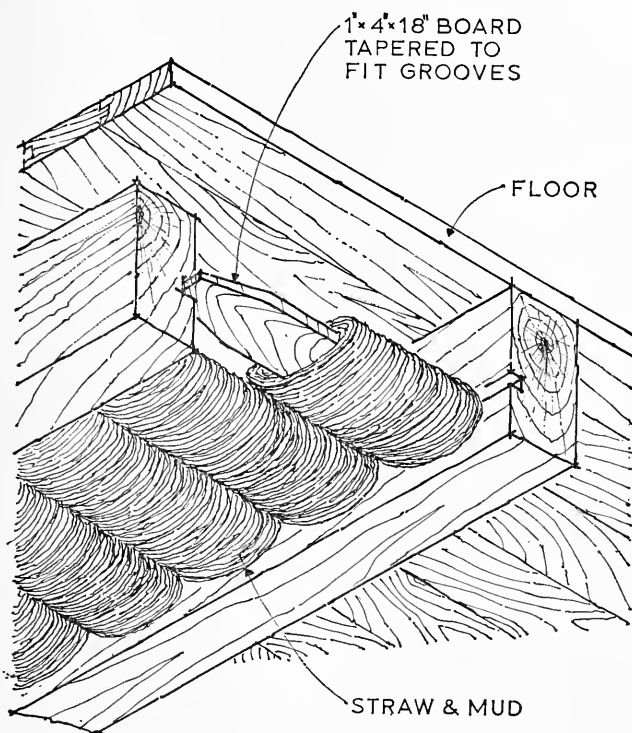
width of the floor joists. This box was filled with earth, thus making a fire-proof hearth. The perimeter of the box was defined with two courses of brick and the top was covered with a mixture of brick and stone. The brick-and-stone mixture made a very pretty and interesting as well as fire-proof hearth. The hearthstone was an unusually large stone which extended from the hearth into the fireplace itself, which prevented there being a joint between the fireplace floor and the hearth.

The fireplace and chimney were built to one side of the center of the house, allowing the "center beam" to be continuous, adding materially to the strength of the structure. The chimney, after it passed through the ceiling of the second floor, was corbeled so that it penetrated the roof at its peak. Thus there was no "cricket" to be flashed and the house was given a more balanced appearance.

Insulation

In both the frame and brick houses "Dutch biscuits" were used for insulation. They were installed in the ceiling of the first floor as well as in the attic. Under the second floor they also served as a sound-proofing device. The biscuits used by the Harmonists were made by wrapping a piece of wood 1 by 4 by 18 inches with straw and mud until it measured about 4 by 7 by 18 inches. The ends of the wood were tapered to fit into grooves cut into the sides of the ceiling rafters. After installation the top of the biscuit layer was covered with clay while the ceiling plaster was put directly on the underneath side of this fireproof layer. (See Plate V.)

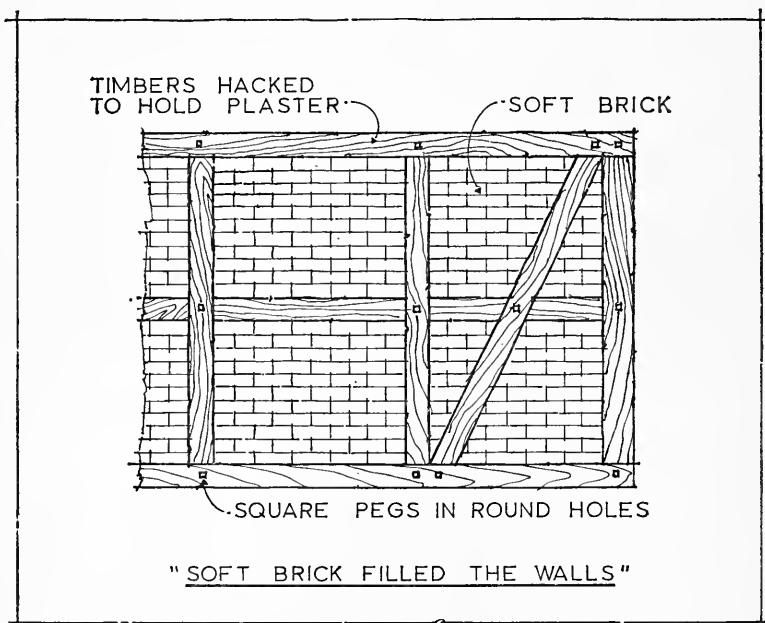
In the frame house additional insulation was in the form of soft brick which filled the walls between the outside weatherboarding and the inside plaster. Realizing that less dense material offered better insulation, the Harmonists used lightly packed and little-baked brick for the filler, and often the brick that was thus used was "sun baked." The courses of this insulation brick were laid with clay instead of lime mortar, lime being difficult to procure. For added strength occasional



DUTCH BISCUIT

courses of hard-baked, load-bearing brick were installed in the insulation. (See Plate VII.)

This type of insulation was used in the inside walls of both brick and frame houses so that the heat from a heated room would not be lost to an unheated room and also that there would not be the loss of body heat by radiation to the unheated walls. This is the principle of radiant heat, and the reason that a house at 75° is warmer in the summer than in the winter.



This wall insulation also serves as an excellent sound barrier, muffling both sounds from without and within the house. The soft plaster and solid walls lend most pleasing accoustical qualities to the Harmonist houses. Household noises are confined to the rooms in which they occur.

Another and very important function served by both the brick filler and the "Dutch biscuit" insulation was that of acting as a fire barrier. The Harmonists possessed the most modern fire-fighting equipment of their day, but it was not too effective, and it is this insulation barrier that is responsible for

so many of their houses surviving to this day. As each room was surrounded by noncombustible material, a major fire in one room would not spread to the next. Too, with the area between the studs in the walls being filled, there would be no opportunity for a fire to reach the roof as this passageway was thus cut off.

Mass Production and Standardization

The ease with which the Harmonists produced their houses was achieved by standardization of parts and mass production. Timbers were prepared at the mill and marked with the proper erection numbers in much the same manner as used by the modern prefabrication builder. When a house was to be erected, the proper number of each item was taken to the site and the framework assembled on the ground, the final adjustment thus being made under conditions which did not require that the weight of the timber be supported. When the actual erection was underway, the pieces fitted together without difficulty because of this intermediate step.

Mortises and Tenons

All of the joints in the framework were made with mortises and tenons, and the tenons were large enough that there was no danger of their being broken at the connection point. The "fit" of the bodies of the timbers was so fine that the tenons served only to hold them in place and were not involved in the stress function of the member.

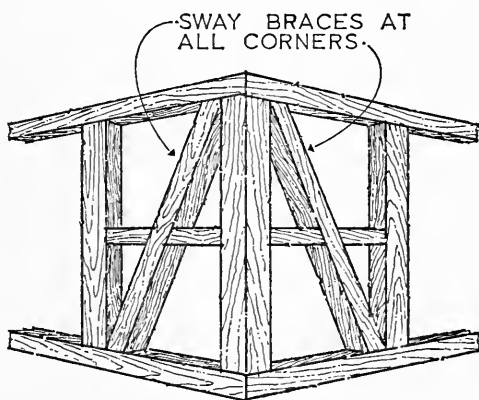
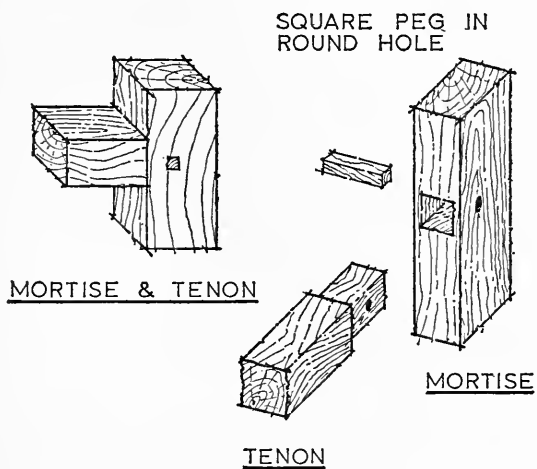
The locking pegs were approximately square and they were driven into round holes. Prior to their being used, the pegs were baked dry, and after they had been driven into the timber and absorbed the normal amount of moisture, they swelled and galled into the timber. Those pegs which were driven in 1814 are still as tight as they were then, and joints which they hold are still as firm.

Hard Wood and Poplar

The locking pegs were of hard wood and framing was usually of poplar, this soft wood being perfect for this method of joining. Poplar was used, first, because it was workable and yet it had sufficient strength; second, it was not affected by the changes in temperature and moisture, the wet-dry and the thermal cycles not causing it to warp out of shape; and third, poplar was not attacked by insects as were the other native woods. Occasionally we have seen evidence of some little insect attack on sap wood but never on any of the heart wood that was used in the houses. It is a strange sight to see new and harder woods completely eaten away while that which has been installed one hundred and fifty years is still in good condition.

Sometimes the Harmonists did use walnut in the frames, but only occasionally. Even their paneling and furniture was made of poplar in preference to other varieties of wood that were in abundant supply. "Hill" poplar was used in preference to "low ground" poplar which grew in low moist areas and had a loose open grain that resulted from the rapid growth. Such grain was likely to become raised. Also there was considerable difference in the strength of the two types of wood.

The Harmonists' ability to handle and work with large pieces of wood is almost unbelievable. The corner posts were not a composite but rather a single piece of wood with a quarter removed to accommodate the laths of the interior walls. The mortises and tenons which were cut on the heavy timbers of the framing were as meticulously made as if they were part of a cabinet. The whole house was built with very little tolerance, the frame made rigid by the many sway braces described below, and it was mandatory that all the parts be made to a very exact pattern. The loads were not carried from one member to the next by the tenons, but rather these items were only a means of fastening the joinings, and the loads were transferred by the bodies of the members themselves.



Sway Braces

The framing of the houses included sway braces at all of the corners, both on the interior and exterior. These braces were made by installing 4-by-6-inch timbers diagonally from the top plate to the bottom plate and anchoring them with the mortises and tenons. At the point where the brace and the nail tie intersected, the nail tie was cut, allowing the brace to be a continuous piece of timber, and the nail tie was mortised into it so that it served as a stiffener for the brace.

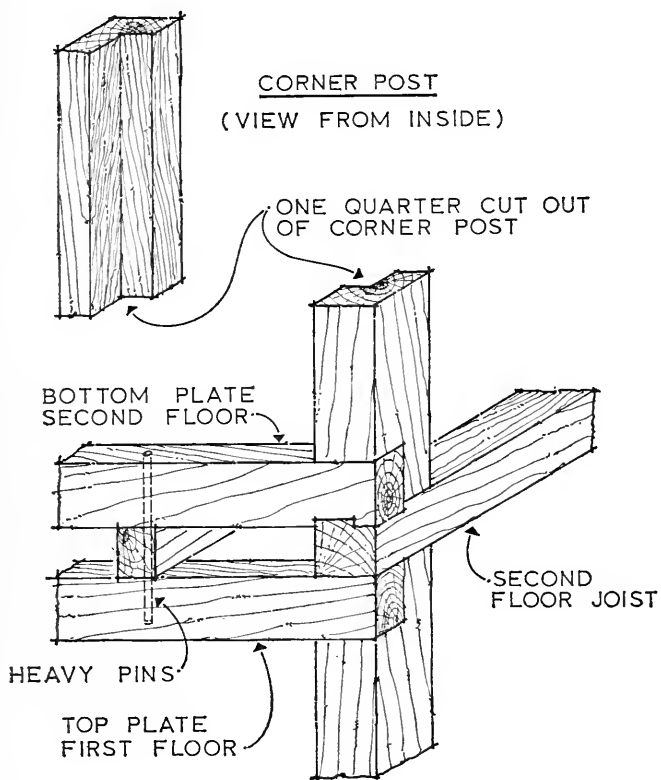
At the outside corners the braces are in two directions, and at the center post and the point where the inside walls intersect the outside walls they are in three directions. The effectiveness of the braces is increased by their being incorporated into the walls, which prevents the slightest chance of their being moved from their position. They are further strengthened by their being meshed into the soft brick.

These corner braces serve not only for sway bracing but also serve in the truss pattern which transfers the loading of the house to the nine foundation points already mentioned.

Independent Unit System

The framing for each floor of the two-story house was complete within itself; the two floor systems were then tied in such a manner that they functioned as a unit. The studs and the corner posts of each system were mortised into the top and bottom plates and fastened with square pegs. Floor joists for the second floor rested on the top plate of the first floor; the bottom plate for the second floor rested on the joists, and all three members were tied in place by large pins. This system makes each floor joist function as a transverse tie and stiffener. Longitudinally, the two plates at the foundation level, the two plates mentioned above, the top plates of the second floor, and the center beams at the level of both ceilings, complete the tying of the whole frame into a unit. (See Plate VIII.)

This unit can be dismantled only by starting at the top and removing the pieces in the reverse order of their installation.



CORNER POST
FRAMING

This rugged frame explains why it has been possible for some of the houses to have been moved as many as four times without any damage to them. These moves have been made without benefit of modern house-moving equipment. In some instances the houses were moved on rough, uneven rollers shaped from logs. As a rule timbers were laid on the ground to make a rude track and to prevent the rollers from settling into the ground. The power for pulling the house forward was supplied by a "stump-puller" which would be anchored to trees along the route the house was taken. A house's ability to withstand such treatment very eloquently attests to the effectiveness of its planning and subsequent execution.

The Roof

In spite of the Harmonists not having used a ridge pole of any description, none of the houses show any sag to the roof line. The enduring strength was achieved by building each pair of roof rafters into an independent truss with the ceiling rafter serving as its bottom chord. The ends of the roof rafters were mortised into this chord so that it was impossible for them to spread.

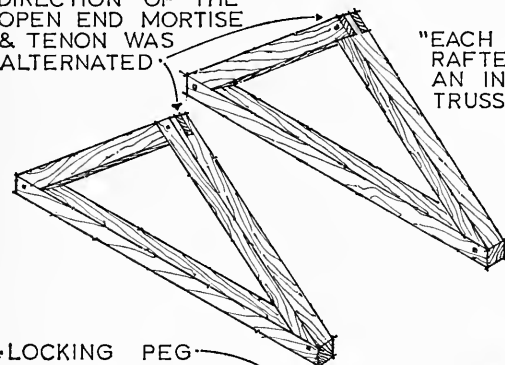
The "Dutch biscuits" which were installed between the chord-ceiling rafters formed a stiffened plane the full length and width of the house, so that there was no chance of any motion in any direction.

At the apex of the trusses the rafters were joined in an unusual manner: the end of one member butted against the bottom of the other and they were fastened with a mortise and a tenon joint and locked with the square peg. With each pair the direction of the overlay was alternated. The roof was decked with long boards which tied the sets of rafters together so that there could not be any motion in any direction. With this system the entire weight of the roof, both dead and alive, resolved itself into tension in the bottom chords.

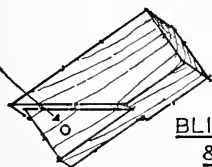
Also, with this system, the roof was not weakened by being penetrated by the chimney, as only the decking was cut and the

DIRECTION OF THE
OPEN END MORTISE
& TENON WAS
ALTERNATED.

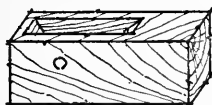
"EACH SET OF
RAFTERS WAS
AN INDEPENDENT
TRUSS"



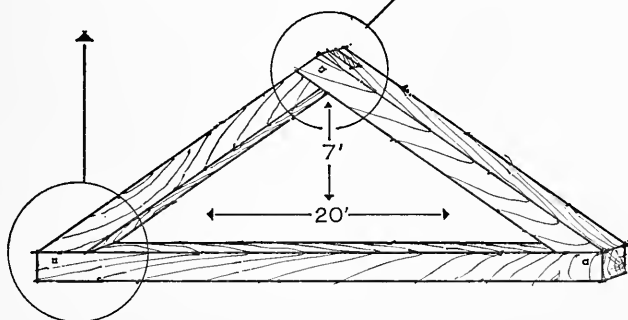
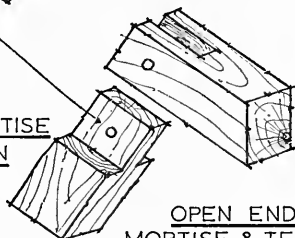
LOCKING PEG



BLIND MORTISE
& TENON



OPEN END
MORTISE & TENON



ROOF TRUSSES

trusses were not affected in any way. As noted above, the chimney was corbeled and made its exit at the center of the house, eliminating the "cricket" and the problem of flashing.

As there were no vertical members in the trusses, all of the weight was carried to the outside walls and none of it transferred to the interior walls. The ceilings of both floors were carried by the walls and the "center beams"; thus there was no intermixing of the loads. With this arrangement neither the snow load of winter, nor wind vibration, nor expansion and contraction due to changes of temperature had any effect on the interior walls and ceilings. Each system—the inner and outer—was independent of the other and neither could do damage to the other.

The massiveness of the ceilings—Dutch biscuits, thick clay plaster, white finish coat—and the clay fire barrier together with the independent suspension as described above, has resulted in the houses surviving a century and a half.

To prevent the expansion and contraction of the flooring of the second floor from having an effect on the ceiling of the first floor, the flooring of the second-story was cut the width of the house and laid on one single joist. This made an expansion joint which would cushion the expansion and contraction caused by differences in temperature in the two parts of the house.

From the long boards, many the length of the house, which were used for sheathing the roof, there developed not only strength but also protection against the splitting of the wooden shakes which were put over them as the final roofing material. With this solid decking there was very little chance of damage to the roof either from drying action by the sun or injury from wind or hail.

To establish cross ventilation windows were installed on either side of the attic; thus the summer heat would not be captured to raise the house temperature uncomfortably, and quickly after sunset the temperature against the second floor ceiling would go down and fresh air would bring in enough

moisture to prevent "dusting" of the clay and dry rot of the timbers in the roof system.

Walls and Ceilings

Laths were made of split hickory of long and varied lengths. The varied length "broke the joints," discouraging cracks in the plaster. The lath nail was coated to prevent rust staining the finishing coat of paint. The Harmonists sometimes used wall paper of their own manufacture, which they blocked in the same dye house in which they finished their cloth.

Often laths were installed in areas where it would have been possible to plaster directly on the brick of the insulation wall, thus providing additional insulation and also creating a moisture barrier. The dead air space made by the laths prevented any moisture from the soft bricks penetrating the plaster coat; thus mortar joints of the masonry did not disfigure the interior walls.

As another safeguard against cracking in the plaster coats, generous quantities of hog bristles and other animal hair were incorporated in the undercoat (the modern "brown coat") and a very fine hair is found in the finishing coat. This finish is very thin and thus functions with the undercoat, making heavy reinforcing superfluous.

Procuring lime for mortar and plaster was difficult since there were no limestone outcroppings in the immediate vicinity of the town. As an alternative, the Harmonists gathered mussel shells from the Wabash and burned and ground them into an excellent substitute. Clay was also substituted whenever possible, both in plaster and mortar.

The clay remained pliable and it was seldom that the Harmonists were bothered with cracked walls. Many of the houses have never been replastered, and the walls are still in good condition, and the bond between the bricks or laths is still solid. Because of their choice of materials and their use of certain sound principles of design, even the large areas of

the living room ceilings are still smooth and show no tendency toward cracking.

Good sharp sand for plaster was no problem as there were many sand bars on the Wabash. It is interesting to note that sand was measured in bushels instead of yards, as it is today.

By forcing plaster, reinforced with the animal hair mentioned above, under the slivers of the roughened surfaces of the wall timbers, a bond was formed that is still firm. Even the location of these timbers does not show through the finished coats.

Floor Plan

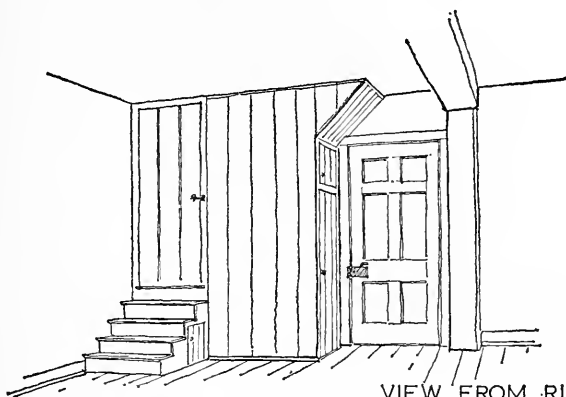
The plans for all the two-story houses were identical. On the first floor there was a large living room which extended the full width of the house and two small rooms, one serving as an entrance hall or "cold air lock," and the other as the kitchen. The heating fireplace was set in the approximate middle of the interior wall of the living room, between the door from the hall and the door from the kitchen. The grouping of the doors and the fireplace allowed the other three walls of the living room to be uninterrupted; hence the usable space was greater than indicated by the square footage of the room.

Entrance Hall

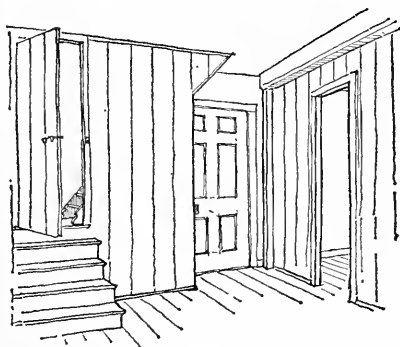
The entrance hall contained the outside door, the door to the living room, and the door to the kitchen, the boots closet and the coat closet, and the stairs to the second floor. The boots closet was built beneath the stairs landing and lower part of the stairs, and the coat closet was under the upper stairs.

This hall or "cold air lock" was a means of preventing the winter wind from blowing into the living area each time the outside door was opened, for the outside door was closed before the one to the living room was opened. This hall also furnished a place for removing great coats and snow-covered boots.

The kitchen door furnished an "outside to kitchen" access for provisions and for fuel for the fires. As the fireplace in



VIEW FROM RIGHT



VIEW FROM LEFT

TYPICAL CORNER STAIR WITH CLOSET BELOW

the living room was adjacent to the door between the living room and kitchen, the fuel for it could be brought in without crossing the living room. Since, as has been pointed out, the inside partition walls were insulated, the "cold air lock" was entirely efficient.

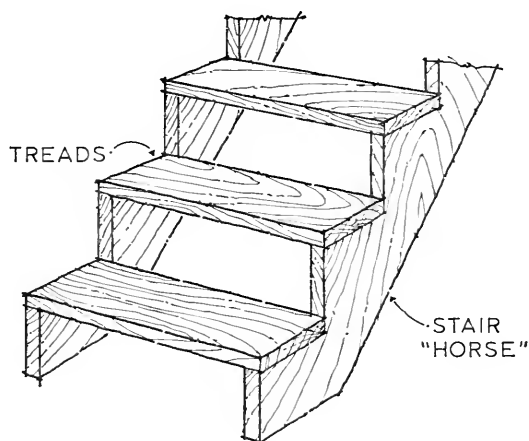
The Stairway

The stairs between the first and second floors were divided into three parts: the lower part built on the side wall, the landing built in the corner, and the upper part built on the end wall, the last part reaching the second floor immediately above the outside door. The whole unit was enclosed with paneling and there was a door at the level of the landing which shut off the upstairs, saving heat and allowing privacy. Below the stairs, as noted, were both the boots and coat closets.

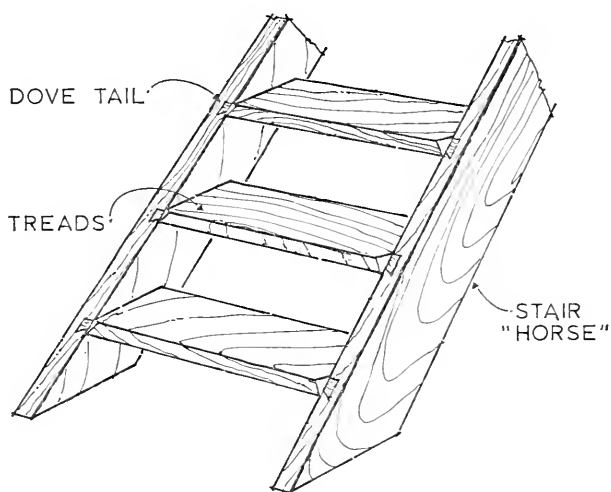
The Harmonists used "ladder type" stairs; that is, the treads were dove-tailed into the side of the "horses" instead of nailed to notches cut into the edges. The notches cut into the conventional stairs weakens them so that support is required along their length. But with the ladder type the full dimension of the wood is utilized and longer spans are possible with complete safety.

The Harmonists put the stairway, a notorious thief of space, into the entrance hall, and it was fitted so closely that part of the outside door facing was cut off by the "horse." This feature is observable in houses both at Harmonie in Indiana, and at Economy, in Pennsylvania. It was not the result of a miscalculation, but rather a space-saving factor.

In this compact design the attic stairs were above and parallel to those to the second floor, and the incline of the attic stairs allowed the required headroom without loss of usable space. The attic stairs were identical to the others except that they were not enclosed. This open construction allowed for the passage of heavy, bulky items directly through the trap door to the attic without their having to be carried up the stairs. As the trap door was 3 by 7 feet, even large pieces of furniture could be put into the attic with ease.



CONVENTIONAL STAIRS



LADDER TYPE STAIRS

The treads of the stairs were only twenty-eight inches wide. This meant space-saving and also no more than one person could occupy a tread at a time.

There are exceptions to be found in the treatment of the stairs in some of the Harmonist structures in Indiana. For instance, in the Ruff-Kilbinger House, which served as the dye plant, the stairs are wider in order to accommodate the workmen who carried large loads of material to the drying loft. In the Barrett-Gate House the stairs were built on the outside, and the entrance to the second floor was on a level one step lower than the floor of the second story. In the house that is now called the "Poet's House," instead of the usual landing there is a spiral turn. This is a most excellent example of Harmonist craftsmanship as all the parts are mortised together and the whole feature shows extraordinary calculation and execution. There is no coat closet under the stairs in "Harmonist House," the house restored by The National Society of the Colonial Dames of America in the State of Indiana. (See Plate VI.)

The Attic

A great amount of space was available in the attic, the distance between the top of the ceiling rafters and the peak of the roof being seven feet. From the care given to the construction of the access and the size of the trap door it would seem that the Harmonists must have used the attic extensively. The ceiling rafters were floored, and as there were no vertical members in the roof trusses, the area was uninterrupted except for the flue.

Both light and fresh air were admitted by the cross-ventilation windows already mentioned, and as the roof was solid and without troublesome valleys to make leaks, items stored in the attics were truly safe from damage.

The Living Room

The plan of grouping both of the doors and the fireplace together on the interior wall left the other three walls of the



PLATE V. Dutch biscuit for insulation

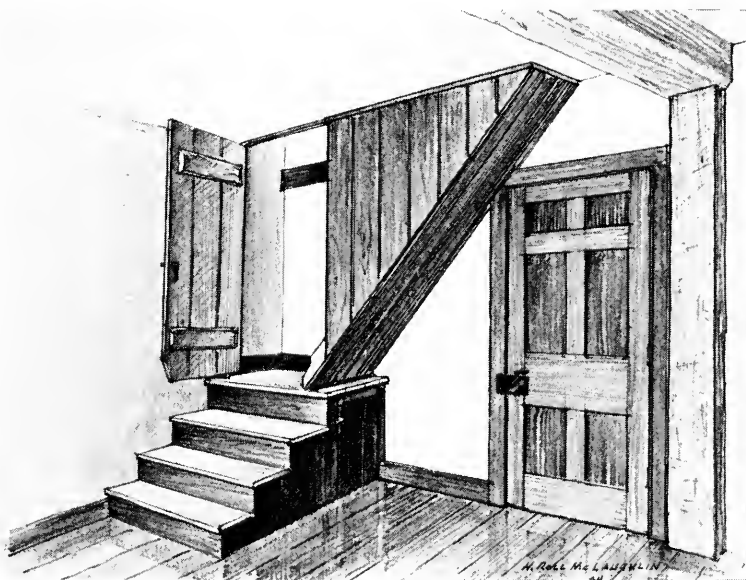


PLATE VI. Entrance and stairs in Harmonist house. Note the "Christian door"

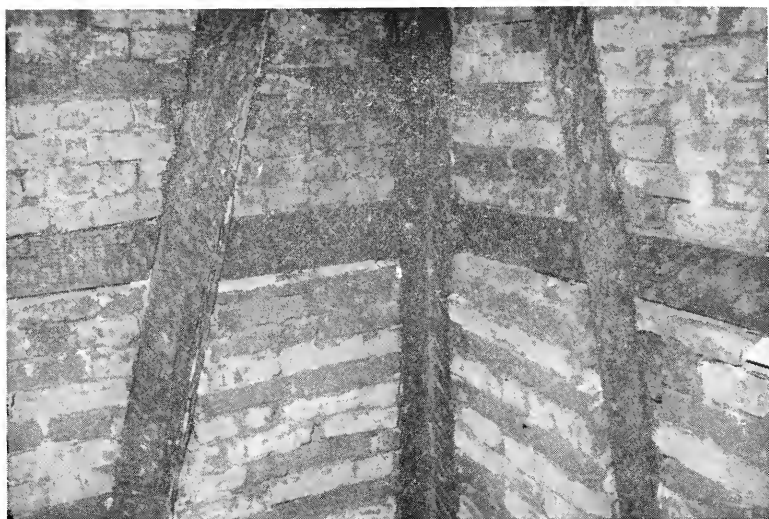
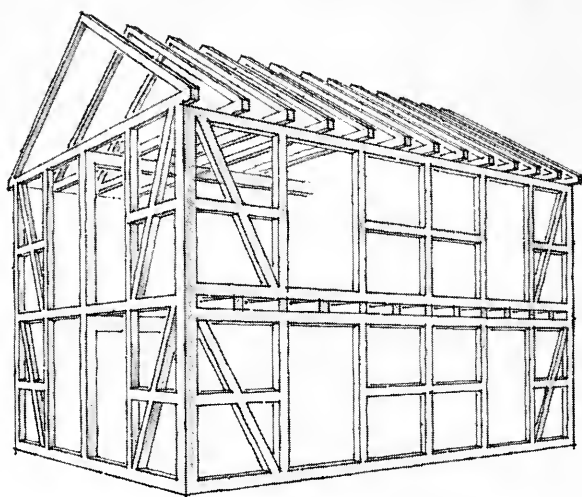


PLATE VII. Soft brick insulation



TYPICAL TIMBER CONSTRUCTION
FOR FRAME HOUSES

PLATE VIII



PLATE IX. Living room
fireplace, *above*, and
kitchen fireplace in
"Harmonist House"



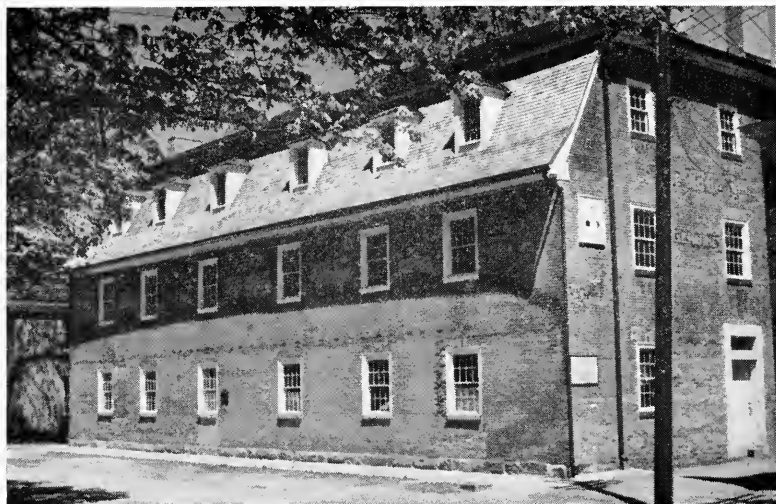


PLATE X. Community House Number Two



TYPICAL FRAME HOUSE
WITH TRELLIS & GRAPE VINE

living room uninterrupted except for a window in each. This allowed cross ventilation and generous amounts of light. The center beam divided the ceiling. This 8-by-10-inch beam ran the length of the house from end wall to end wall, and followed along the true center of the room, entering just to one side of the fireplace. Where the beam was exposed, its edges were beveled or "lamb's-tongued" and it formed an interesting decorative addition to the room.

A column supporting this beam was in the center of the outside wall opposite the fireplace, and the window in this wall was slightly off center.

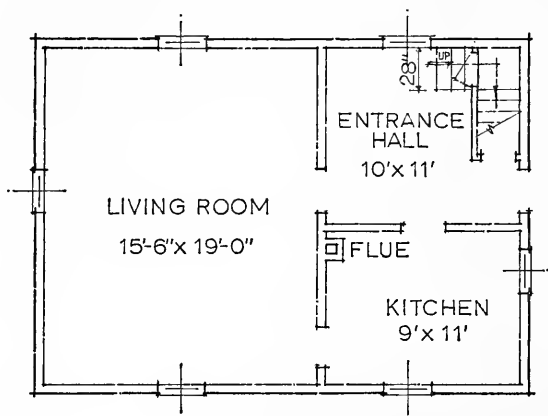
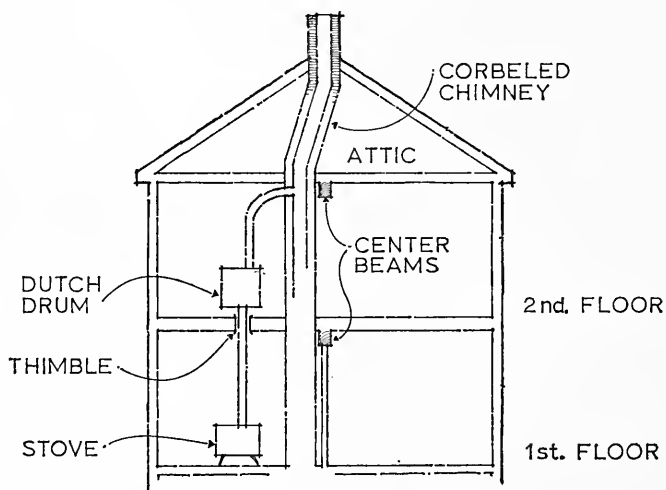
This center beam was an important item in the framework of the house, since together with the four heavy side beams it held the house together longitudinally. Of course, the fact that the flooring and the decking ran parallel to it added materially to the strength. None of the houses, regardless of the manner in which they may have been abused, have shown any tendency to open up at the corners or come apart in any place.

On the lower floor the partition between the entrance hall and the kitchen was built to the bottom of the beam, while on the second floor the partition between the two small rooms was built to the side of the beam. This system made the studs of the lower wall a part of the support to the second floor.

Heating Stoves

When stoves were substituted for fireplaces, both for heating and cooking, the Harmonists removed the large chimneys of the fireplaces and substituted small flues. These were indeed small, and in many cases did not extend to the ground but were supported on wooden columns.

A general practice was to install the heating stove far enough from the wall for the area behind the stove to be useful. By means of a "thimble" through the ceiling and a short pipe, the stove vented into a "Dutch drum" in the large room upstairs. This drum was metal and about three feet in diameter and four feet high, and it, in turn, vented into the flue at about

PLANSECTION

the level of the upstairs ceiling. The drum heated the second floor from the same fire that heated the first floor.

There were several advantages to this method of heating. Among others, it was economical, since both floors were heated from the same fire and same fuel; it eliminated carrying fuel to the second floor, and consequently carrying ashes down; and it eliminated the danger of an unattended fire on the second floor.

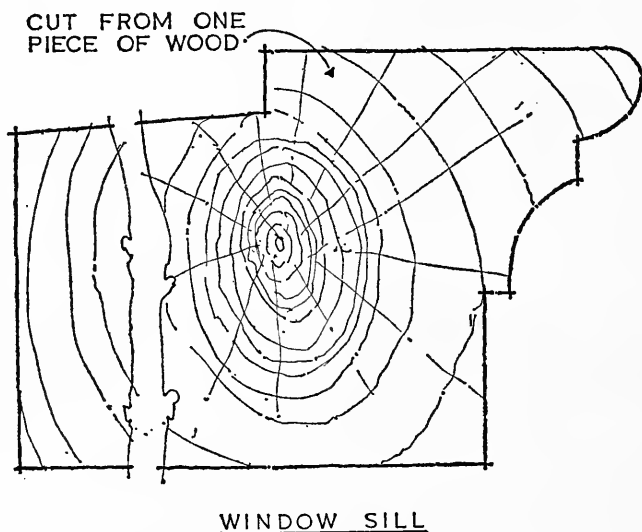
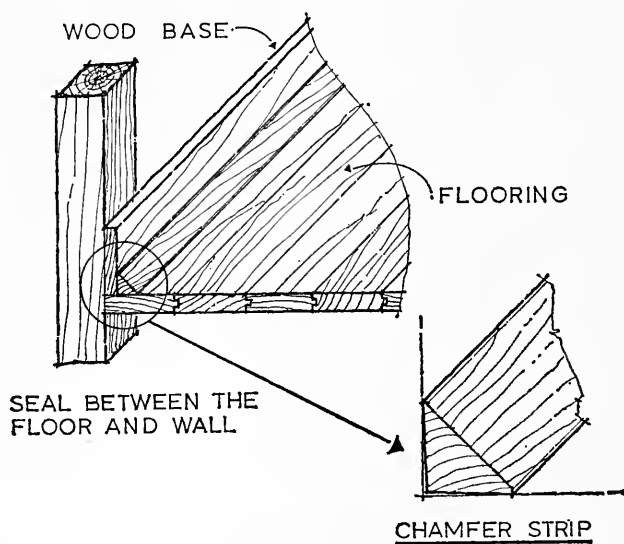
The small flues were corbeled to the center of the roof upon reaching the attic. In none of the houses has there been found any evidence of failure of one of these flues nor of damage from rain running down its side.

The well-constructed, well-insulated houses do not require as much heat as their more breezy neighbors, and they are generally cool in the summer and warm in the winter.

As regards the cooking arrangements, most of the baking was done in the community ovens which were located at various points about the town and fired on regularly scheduled days. The cooking done in the residence was generally of a rather light variety. However, the Harmonists' kitchens were well equipped. Traveling as they did by steamboat and wagon, they were able to bring furnishings with them. Hence, in their kitchens could be found items from Germany and from the East Coast. Also they were aware of innovations in household equipment through their trade with Philadelphia, New Orleans, and other cities. They had their own foundry and many large copper kettles which they manufactured may be found in the area today.

Woodwork and Beading

Instead of the "quarter round" the Harmonists used "chamfer strips" and "skewbacks" to seal any joint where surfaces met at right angles. Where the floors met the walls, in the corners of the paneling, and where wooden panels met masonry, this device made a practical seal. It was not only easier to make but also easier to maintain and clean, and the flat



surface of the skewback offered many fewer problems than the convex surface of the quarter round.

By making the angle at the apex of the triangle slightly more than 90° they were able to secure a much tighter joint to the surfaces, as they forced the "fit" at the other angles. Also, with this type of molding, they were able to nail directly to both of the joining surfaces, instead of depending on a common nail which did not seal either.

The points of the angle were slightly "eased" or blunted to prevent the grain from separating and lifting. This tight seal prevented floor drafts by sealing the cracks between the wall and the floor. To aid this seal the Harmonists installed the baseboard before the wall was plastered, enabling them to nail the baseboard to the studs and thus secure a much more solid connection than if the nail had been put through fragile plaster and then into the stud.

Decorative moldings were very often cut into the wood directly, and this would leave no cracks for weather to attack either the parent wood or the molding itself. For example, outside window sills had a drip molding cut on the outside edge. The pattern was decorative and also functional in that it kept the water from running down the outside face of the sill and thence between it and the weatherboard or brick of the wall.

Simple beading was the favorite method of decoration, from the single beading of the paneling and trim to the multiple beading of the door sections. On the principal door of the church the beads were small enough to allow ten to the inch. Beading planes were used on the job site and beading made as it was needed.

Beading was used on all the trim both for the exterior and the interior. The size of the board determined the width and depth of the bead, and the cut was always in good proportion, neither too small nor too large.

Weatherboarding

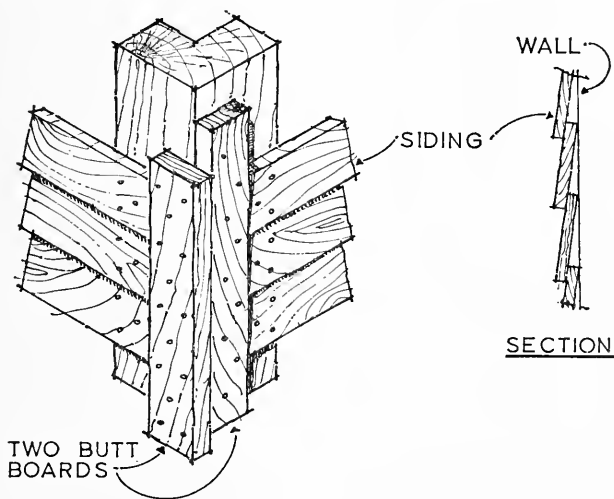
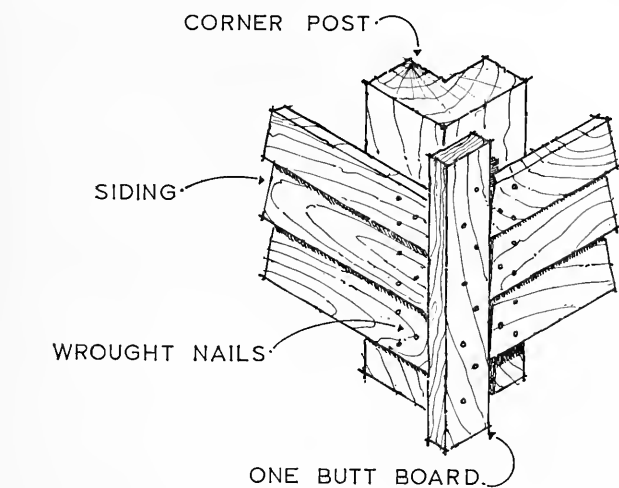
On the frame houses weatherboard siding joined at the corners with "butt boards" instead of miter joints was a decorative as well as a practical weather proof system. Both of the vertical boards and the ends of the siding were nailed to the same corner post, so that it was impossible for any of them to become disarranged either by weather or by physical damage. The vertical "butt boards" became a part of the trim and were a pleasant relief from the horizontal laps of the siding.

As the ends of the weatherboarding were always sealed with paint to the sides of the "butt board," it was impossible for the open-end grain to absorb moisture. And as the foundations were high enough to keep side walls well separated from the ground, none was picked up there. The foundations of the frame houses, as noted earlier, were open piers, allowing the air to circulate freely under the house, keeping the areas dry and the timbers free of rot.

The poplar weatherboards installed between 1814 and 1824 are still firm. If by chance one of them is split, it still shows the bright yellow color it had when attached, time and weather having affected only the surface.

Locally made wrought nails were used to fasten the siding, and they, too, are as firm as when installed. When it becomes necessary to remove one of them, the only recourse is to break it at the surface as it cannot be pulled out.

Visitors to Harmonie reported that many of the frame houses were not painted and the silver gray of the unpainted wood was outstanding. The lack of paint does not seem to have shortened the life of the walls and the siding. One of the houses that was razed in 1945 had never had a coat of paint, either during the community period or during the ensuing years. The weatherboarding and the exposed members of the frame were in such good condition that they were used in rebuilding other houses. The houses were designed so that the rain ran off before the boards were water soaked and damaged.



CORNER BUTT BOARDS

The Enduring Quality

The house razed in 1945, mentioned above, also attested to the efficiency of the bracing system and interlocking frame. The foundation piers were badly out of level; hence the house was badly out of plumb, yet there was no indication that the relationship of the members had been altered. The angles in the corners were still 90° as built, the ridge line of the roof was still straight, the "Dutch biscuits" were still in place. Any movement had been as a unit.

It is only when someone tries to "improve" one of the houses, by making a change in the basic design, that damage occurs. If stress analysis is disregarded, and strength is taken from the house by alteration of partitions or removal of some item from the frame, or loads are developed at the wrong points, then damage is done. On the other hand, if the house is left intact, it will stand a tremendous amount of abuse.

As designed, each member of the frame has its job to do, and when one is weakened or removed, just that much more load is transferred to another member not designed to absorb it. Hence that much strength is taken away from the whole structure.

The Harmonist builder was aware that the brick-filled walls and biscuit-filled ceilings were very heavy, and he planned and then built his house accordingly. The partitions on the second floor were above those on the first so that the loads were carried to the foundation by the heavy timbers in the walls, and the sway bracing in the corners stabilized the two floors together. Special attention was given to the points where the interior walls met. This became the principal column supporting the center of the second floor through the support of the center beam. This column was, in turn, supported by a pier which was free from the flue foundation, even though they were side by side.

It is of interest to note that later occupants had tried to improve the plan of Community House Number Two. Partitions were removed for "better" space utilization, and all three

floors sagged to a dangerous degree. When the building was restored to the original plan, the sagging was corrected. Incidentally, even though the floors sagged extensively, the truss support for the roof, as described above, kept the building in true alignment and prevented damage. And not only the roof had to be supported by the trusses, but also the many "Dutch biscuits" that were incorporated in the same system of loading.

Provisions for Rain Runoff

To eliminate the hazard of rain water backing up beneath the shakes or shingles, the final roofing material, the Harmonist did not use the customary gutter. Instead the water was allowed to run off the roof. Sometimes the ground beneath and adjacent to the house was mounded slightly above the surrounding level and the drip water ran off over it. Often a stone walk was laid under the drip to prevent the water making a ditch and to provide a controlled channel.

But by far the most novel method was the use of grapevines that were grown on trellises that encircled the house between the windows of the first and second stories. Vertical trellises with horizontal cross bars were also placed on either side of the four corners of the house and grapevines planted to grow on them. These vine-covered trellises, aside from catching and dispersing a large part of the drip water from the roof, also served as an effective fire escape from the second floor. (See Plate XI.)

The vines were well attended and very attractive. They were never permitted to grow under the siding or to encourage rot through the shading of the poplar weatherboarding. The grapes that were produced were not wasted but added to the common supply from which very excellent wine was produced.

Balance of Design

The delicate balance of the design of Harmonist two-story houses is attested to by the fact that the slightest alteration disturbs and destroys the harmony of the whole. The substitu-

tion of solid windows for the eight-paned windows ruins a house. The same is true in reverse—the restoration of the original windows makes the house again a pleasing object. Of course, in the use of the smaller panes, the Harmonist was combining the practical and the artistic, inasmuch as if a pane was broken, the repair would be minor and the smaller pane would withstand the winds of winter better than the larger ones.

The Functional and the Beautiful

The Harmonists successfully combined the beautiful and the functional. Visitors to the town were always impressed with the care taken in the construction of their houses and buildings. Here in the wilderness they achieved a quality expected only in more established parts of the country. The Harmonists were not inclined to waste time on the purely decorative and the frivolous. To them curlicues were expensive in time, both in their making and their maintenance. Confronted with the task of creating a completely new town they were not inclined to waste time or motion in tasks not truly useful. Still the results that they achieved were symmetrical and pleasing.

Their furniture reflected this attitude most emphatically. Chairs were made to fit the individual, and were both solid and comfortable. At the same time they were satisfying to the eye. The Harmonist craftsman used his heated iron to make patterns to break the monotony of large surfaces and long legs and spindles. While chair bottoms were made of heavy wood, the bottom edges were beveled so that the chair did not appear bulky and ponderous. One ingenious chair design had a back shaped like a slightly concave heart, so that regardless of how the sitter turned, the back was there for support. The seat was beveled and graceful. The Harmonists had rope beds, and one of the rails was left loose so that the tension of the spring ropes could be adjusted to suit the individual. The great flocks of geese which they raised furnished feathers for their billowing featherbeds and pillows.

* * *

The houses which the Harmonists built in their first settlement, at Harmonie, Pennsylvania, were a combination of construction ideas brought from Germany and a knowledge of colonial architecture acquired by some of them who had worked as hired hands during their first winter in America. But still it was a German town built by recent immigrants.

The buildings in Harmonie, Indiana, their second town, reflected certain important advances and advantages. First, the Harmonists now were financially secure. They were seasoned pioneers who had had the profitable experience of having built and lived in a town of their own planning. They could now correct the shortcomings of their earlier efforts. They were experienced in the use of local material and tools. They had greater knowledge of the weather and the requirements it placed on them. Perhaps as important as any other factor was that Harmonie, Indiana, was built by dedicated craftsmen who were pledged members of the community they were creating.

In 1824 the Harmonists decided to move again. This time they were motivated by a desire to find a location closer to the eastern markets. Also western currency was a vexatious problem, and some of their relations with their neighbors were not harmonious. There were complaints that the climate of southwestern Indiana was not too healthful. A new site was purchased in Pennsylvania directly on the Ohio about eighteen miles below Pittsburgh, where the new community of Economy would soon rise. In 1825 Harmonie, Indiana, was sold to Robert Owen who renamed it New Harmony.

Economy, Pennsylvania, the third community of the Harmonists, showed the influence of their American neighbors. Some of the construction was done by local labor, not by community craftsmen, and it became more of a town of prosperous Americans than German immigrants.

In Harmonie, Indiana, therefore, are the best examples of Harmonist construction. Here were built livable homes, economical to maintain, well insulated, centrally heated, mass-

produced with standardization of parts and prefabrication, functional and pleasing in design, fire resistant, weather and storm proofed, termite proof, and with many other advantages.

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